

What Is Claimed Is:

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1. A burner manifold apparatus for delivering reactants to a combustion site of a chemical vapor deposition process, comprising:
5 fluid inlets, fluid outlets, and a plurality of fluid passages extending between the fluid inlets and the fluid outlets, the fluid passages converging toward each other from the fluid inlets to the fluid outlets.

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2. A burner manifold apparatus as claimed in claim 1, wherein the fluid 10 passages have a smaller cross section at the fluid outlets than at the fluid inlets.

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3. A burner manifold apparatus as claimed in claim 1, wherein the fluid 15 passages are isolated from one another so that selected ones of the fluid passages transport reactant precursor materials and different selected ones of the fluid passages transport combustion materials.

4. A burner manifold apparatus as claimed in claim 1, wherein the fluid 20 passages at the fluid outlets are slot-shaped.

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5. A burner manifold apparatus as claimed in claim 1, further comprising at least one pressure inducing restriction device for passing fluid therethrough in narrow elongated streams, the at least one pressure inducing restriction device being positioned between the fluid inlets and the fluid outlets.

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6. A burner manifold apparatus as claimed in claim 5, wherein the at least 25 one pressure inducing restriction device comprises a plate having a series of slots or linearly arrayed apertures therein for emitting fluid therefrom in generally linear streams.

30 7. A burner manifold apparatus as claimed in claim 1, wherein the burner manifold apparatus includes:

a manifold base having a top, a bottom, a front wall, a back wall, and two side walls,

the fluid passages including horizontal fluid passages that extend between the side walls and vertical fluid passages extending from a position within the manifold to the top of the manifold base, and

5 the fluid inlets including fluid inlet ports, each located on at least one of the front wall and the back wall of the manifold base and each being in fluid communication with at least one of the horizontal and vertical fluid passages;

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10 a plate mounted to the top of the manifold base, the plate defining a plurality of apertures therethrough, at least one aperture being positioned at a location above an exit of each of the vertical fluid passages of the manifold base to allow passage of a fluid from the vertical fluid passages through the plate; and

15 a manifold burner mount mounted to the plate,

20 the fluid passages further including manifold burner mount fluid passages that extend from a bottom of the manifold burner mount to a top of the manifold burner mount and terminating as the fluid outlets, the manifold burner mount fluid passages being arranged such that a distance between adjacent manifold burner mount fluid passages is greater at the bottom of the manifold burner mount than at the top of the manifold burner mount, the manifold burner mount fluid passages being arranged symmetrically about a central location on the top of the manifold burner mount.

25 8. A burner manifold apparatus as claimed in claim 7, wherein the vertical fluid passages are symmetric about a first axis bisecting the top of the manifold base.

30 9. A burner manifold apparatus as claimed in claim 7, wherein the vertical fluid passages are asymmetric about a first axis bisecting the top of the manifold base.

35 10. A burner manifold apparatus as claimed in claim 3, wherein the vertical fluid passages include a central vertical passage and pairs of vertical passages, each pair defined by two vertical passages spaced equidistant from the first axis, each pair intersecting a particular horizontal fluid passage to create an array within the manifold base to distribute fluid symmetrically about the first axis.

11. A burner manifold apparatus as claimed in claim 10, wherein each pair of vertical passages and particular horizontal fluid passage is fluidly independent from each other pair of vertical passages and particular horizontal fluid passage.

5 12. A burner manifold apparatus as claimed in claim 7, wherein each of the horizontal fluid passages is associated with a single fluid inlet port.

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10 13. A burner manifold apparatus as claimed in claim 7, wherein the manifold burner mount fluid passages are linear.

14. A burner manifold apparatus as claimed in claim 7, wherein the top of the manifold base includes grooves therein, each groove positioned at an exit of one of the vertical fluid passages.

15. A burner manifold apparatus as claimed in claim 14, wherein exits of the vertical fluid passages in the manifold base and corresponding grooves in the top of the manifold base are in alignment with linear entrances to the manifold burner mount fluid passages.

20 16. A burner manifold apparatus as claimed in claim 7, wherein the plate has a linear array of apertures, and lines of the linear array are in alignment with the exits of the vertical fluid passages in the manifold base and the linear entrances of the manifold burner mount fluid passages.

25 17. A burner manifold apparatus as claimed in claim 16, wherein the apertures of the plate are smaller in size than the exits of the vertical fluid passages, such that the plate operates as a pressure plate to evenly distribute fluid symmetrically throughout the manifold base.

30 18. A burner manifold apparatus as claimed in claim 7, and further comprising securing elements mounted to the top of the manifold burner mount for securing a burner thereto.

19. A burner manifold apparatus as claimed in claim 18, wherein the securing elements comprise a pair of clamps releasably secured on either side of the top of the manifold burner mount for securing the burner over the manifold burner mount fluid passages.

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20. A burner manifold apparatus as claimed in claim 19, wherein the clamps each have an outer edge and an inner edge, the inner edge having a shoulder that engages a burner to be mounted to the manifold burner mount.

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21. A burner manifold apparatus as claimed in claim 20, wherein the inner edge of each clamp has a tapered surface that tapers away from the top of the manifold burner mount.

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22. A burner manifold apparatus as claimed in claim 19, further comprising a spring mounted between each clamp and the manifold burner mount.

23. A burner manifold apparatus as claimed in claim 7, wherein the manifold base, the plate, and the manifold burner mount are generally rectangular.

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24. A burner manifold apparatus as claimed in claim 23, wherein the burner manifold apparatus comprises a plurality of burner mounts, a plurality of plates, and a single manifold, the single manifold having a thickness dimension between the front wall and the back wall, the thickness of the single manifold being greater than a thickness dimension of the burner mounts and the plates such that a plurality of burner mount/plate combinations may be mounted to the manifold.

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25. A burner manifold apparatus as claimed in claim 7, wherein the fluid inlet ports are located on the front wall of the manifold.

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26. A burner manifold apparatus as claimed in claim 7, wherein the fluid inlet ports are located on the back wall of the manifold.

27. A burner manifold apparatus as claimed in claim 7, wherein a first set of the fluid inlet ports is located on the front wall of the manifold, and a second set of the fluid inlet ports are located on the back wall of the manifold.

5 28. A burner manifold apparatus as claimed in claim 1, further comprising:
a plurality of manifold elements positioned in a stacked arrangement such that
fluid passages extend through the manifold elements and terminate at the fluid outlets,
the manifold elements fluidly communicating with each other via the fluid passages,
each of the manifold elements having a greater number of fluid passages than a
10 manifold element stacked therebelow such that the topmost manifold element has a
greatest number of fluid passages therethrough and such that the fluid passages
converge at the fluid outlets.

15 29. A burner manifold apparatus as claimed in claim 28, wherein each of the
manifold elements includes at least one fluid inlet port.

20 30. A burner manifold apparatus as claimed in claim 29, wherein the
lowermost manifold element has a single fluid inlet port and the remaining manifold
elements have two fluid inlet ports.

31. A burner manifold apparatus as claimed in claim 30, wherein, in the
remaining manifold elements, fluid is split evenly between the two fluid inlet ports.

25 32. A burner manifold apparatus as claimed in claim 29, wherein the fluid
passages are linear and extend vertically through the manifold elements.

33. A burner manifold apparatus as claimed in claim 32, wherein outermost
fluid passages of each of the manifold elements communicates with the associated fluid
inlet ports, and inner fluid passages are isolated from the outermost fluid passages.

30 34. A burner manifold apparatus as claimed in claim 33, wherein fluid
passages of adjacent manifold elements are in vertical alignment.

35. A burner manifold apparatus as claimed in claim 33, wherein the inner fluid passages are vertical, rectangular slots.

5 36. A burner manifold apparatus as claimed in claim 29, wherein the fluid passages are symmetric about a central fluid passage.

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10 37. A burner manifold apparatus as claimed in claim 1, further comprising: a tapered section having a first end defining the fluid outlets and a second end defining the fluid inlets, the first end having a smaller surface area than the second end.

38. A burner manifold apparatus as claimed in claim 37, wherein selected ones of the fluid passages are blocked to prevent fluid from passing therethrough.

15 39. A burner manifold apparatus as claimed in claim 1, further comprising: a tapered section having a first end defining the fluid inlets and a second end, the first end having a larger surface area than the second end; and a top section having a first end in fluid communication with the second end of the tapered section and a second end defining the fluid outlets, wherein the fluid passages extend through the tapered section and the top section to convey fluid from the first end of the tapered section to the second end of the top section.

20 40. A burner manifold apparatus as claimed in claim 39, wherein the top section is coextensive with the tapered section.

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41. A burner manifold apparatus as claimed in claim 39, wherein the burner manifold is formed by an extrusion process.

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42. A burner manifold apparatus as claimed in claim 39, wherein the burner manifold is formed by a hot draw process.

43. A burner manifold apparatus as claimed in claim 39, wherein selected ones of the fluid passages are plugged.

44. A burner manifold apparatus as claimed in claim 43, wherein the selected ones are filled with a solid material.

45. A burner manifold apparatus as claimed in claim 43, wherein the solid material is at least one of epoxy and silicone.

46. A burner manifold apparatus as claimed in claim 39, wherein the burner manifold apparatus comprises a glass material.

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47. A burner manifold apparatus as claimed in claim 39, wherein the burner manifold apparatus comprises a ceramic material.

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48. A burner manifold apparatus as claimed in claim 39, wherein the burner manifold apparatus comprises a silica material.

49. A burner manifold apparatus as claimed in claim 39, wherein the top section is cylindrical.

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50. A method of manufacturing a burner manifold for use in a chemical vapor deposition process, comprising:

extruding a plastic composite of a honeycomb matrix at least partially through a die having a tapered section such that a first end of the manifold has a smaller surface area than a second end of the manifold.

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51. A method of manufacturing a burner manifold as claimed in claim 50, further comprising:

prior to the extruding step, filling the honeycomb matrix with a fill material.

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52. A method of manufacturing a burner manifold as claimed in claim 50, further comprising:

after the extruding step, removing the fill material from the honeycomb matrix; sintering the honeycomb matrix; and

plugging selected channels of the honeycomb matrix with another fill material.

53. A method of manufacturing a burner manifold as claimed in claim 52, further comprising:

5 after the plugging step, sealing a burner to a first end of the manifold.

54. An arrangement of burner manifold assemblies for use in a chemical vapor deposition process, comprising:

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54.1 a manifold having fluid passages therethrough and a plurality of fluid inlet ports;

a plurality of burner mounts mounted to the manifold and having fluid passages in fluid communication with the fluid passages of the manifold, the burner mounts each having a linear array of slots on a top thereof for emitting fluid therefrom, the slots of the burner mounts being in linear alignment with slots of adjacent burner mounts; and

15 a plurality of flow restriction devices positioned between the manifold and each of the burner mounts.

55. An arrangement as claimed in claim 54 wherein the plurality of flow restriction devices comprise a plurality of pressure plates having apertures therethrough, the apertures being in alignment with the manifold fluid passages and the burner mount fluid passages for emitting streams of fluid from the manifold into the burner mounts.

56. A burner manifold assembly for delivering reactants to the combustion site of a chemical vapor deposition process, comprising:

25 a burner manifold apparatus having fluid inlets, fluid outlets, and a plurality of fluid passages extending between the fluid inlets and the fluid outlets, the fluid passages converging toward each other from the fluid inlets to the fluid outlets; and

30 a burner mounted to the burner manifold apparatus, the burner having a linear array of at least one of slots and orifices, the linear array being in fluid communication with the fluid passages at the fluid outlets.